industry is making slow progress compared with Germany.

The United States is practically an agricultural country, for its wheat, cotton, flaxseed, corn, cereals and lumber are larger than its manufactures, yet it soon will lead in metals, and it is fast coming to the front in its chemical industries.

The engineer may brag of his skill, but he has done nothing greater than the pyramids, nor finer than the temples of Greece and Egypt. The monuments he has wrought in steel were given to him by the ability of the chemist to control carbon in iron, and the economic principle involved in the production of steel supplies work, puts money into circulation, and keeps the wheels turning.

If it were not for chemistry and the knowledge that has been gained in the fertilization of soils, we would have often exhausted the miles of ground which have made this country what it is, and even now the very work which is going to maintain the entire civilization is the production of nitrogen from the air, a purely chemical investigation which may be the greatest civilizing factor of the age.

Twenty-five years ago the chemist was a man who made analyses, and whose knowledge was confined to inorganic materials, and a few organic substances. To-day there are very few analytical chemists in ratio to the population, for nearly all works maintain laboratories where chemists are employed and researches are continued, so that by-products which formerly were waste, to-day are converted into commercial products.

The brewing industry years ago looked upon the chemist with considerable doubt, for the first influence the chemist had upon the brewing industry resulted in the manufacture and use of bicarbonate of soda to produce froth, and salicylic acid to prevent fermentation. It took the chemist many years to convince the brewer that he could do without these materials, and today the modern brewmaster has a chemical training and conducts the process of brewing upon scientific principles.

It is only a few years ago that some of our members assembled at the grave of Priestley and marked the centennial of the discoverer of oxygen.

For a science so young, its civilizing influence is enormous, and there is no doubt that the rapid progress which it made in the nineteenth century will be outstripped in the twentieth, for the control of our foodstuffs, the application of the raw materials in the earth, and the refining of metals, create positions, give progress to a country, and help largely in the establishment of that profession in which we are all factors.

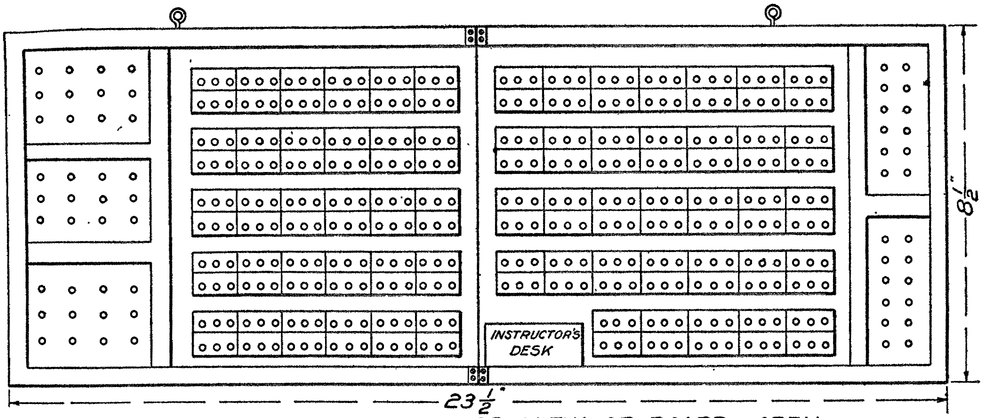
MAXIMILIAN TOCH
NEW YORK CITY

A PROBLEM IN LABORATORY ADMINISTRATION—ITS SOLUTION

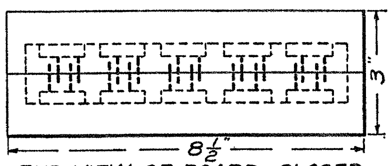
A READING of the excellent article by Professor Baskerville on "Laboratory Organization" which appeared recently in SCIENCE, has prompted the writer to speak of one of the difficult phases of laboratory administration and an attempt at a suitable and efficient solution of the same. This note is written in the hope that it may offer some suggestion to those working on the same general question, modified, of necessity, by local conditions.

For a number of years there has been a steadily increasing growth in the number of students taking general elementary chemistry in this laboratory, until the gross registration for the present academic year shows an enrolment of 725. For lecture purposes this number is divided into four sections of 220, 220, 180 and 105 each; for quiz into groups of 25 to 30 each. For laboratory purposes, the classes are divided into eight sections, which are accommodated in two large laboratories, each containing 126 desks of three lockers each, or a total of 756 lockers. The general

plan for laboratory work is to assign three students, each of a different section, to every desk, one locker being provided for every person. The laboratory sections vary in size from 80 to 110 students, and it thus becomes apparent at once that assignment of lockers on the above basis becomes increasingly difficult as the total number of students approaches the total number of lockers. This phase of laboratory administration together with that arising from the registration of students during the academic year; unavoidable transfers in sections due to change of daily schedule; students withdrawing from the university; rearrangement of students in order to economize the time of the teaching force; these with others that readily suggest themselves have been questions demanding quick and efficient solution. In order to meet these situations successfully and with the greatest economy in time, the following device has been prepared. Two key-boards have been constructed, each being a model of the general desk arrangement of the laboratories (see design for details). In the numbered holes are placed steel dowel pins, painted in various colors. To illustrate better the general assignment above mentioned and the use of the board for these purposes, an actual case is given; the Monday and Tuesday afternoon laboratory division (lockers 1, 4, 7, 10, 13, etc.) are all indicated by yellow pegs; Thursday and Friday afternoon division (lockers 2, 5, 8, 11, 14, etc.) by red pegs; Wednesday and Saturday division (lockers 3, 6, 9, 12, etc.) by white pegs, other sections by other colors. After all the students have been assigned lockers, a record of the same is made on numerically tabbed index cards and thus a complete record of both laboratories is kept in the office of this division of the department of chemistry. A glance at the details of the diagram shows that each board can be folded without the



TOP VIEW OF BOARD - OPEN



END VIEW OF BOARD - CLOSED

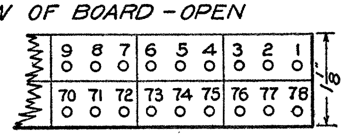


DIAGRAM OF DESK SHOWING NUMBERS

least danger of the pins becoming displaced. By means of an alphabetical card index (5″ × 4″), used in conjunction with the above, there is kept always at hand such data in reference to the student as name, college, locker number, number of course, test grades, laboratory grades, quiz grades, final grades, term standing, laboratory section, quiz section, lecture section, etc. One further example of this system will illustrate its use; notice is received by the department of chemistry from the registrar that John Smith has withdrawn from the university. On receipt of the same, the alphabetical index is consulted for locker number of the student, say number 12. The with-

drawal and date are noted on this card, which is then refiled. Card 12 of the numerical index is withdrawn and replaced by a new one, at the same time peg 12 is taken from the board and placed in the side compartments, the vacant peg-hole showing at a glance the availability of this locker. In assignment of available lockers, one need only bear in mind that two pegs of the same color can not be placed on the same desk, and thereby conflict will be avoided. Thus, without multiplying examples, it at once becomes apparent that this system gives one a ready and simple control of the laboratories. By this system, classes of seven hundred are handled with great facility.

The writer wishes to express his thanks to Mr. Harry Mougey, of this laboratory, for several suggestions made in the construction of the above board.

Wm. Lloyd Evans
Ohio State University,
September 8, 1909

EDUCATIONAL AIMS IN THE TEACHING OF ELEMENTARY GEOMETRY, HISTORICALLY CONSIDERED[1]

The two educational aims that have stood out distinctly in the history of the teaching of geometry are the practical[2] and the logical. Of course in the early development of geometry the term teaching can not be used with its modern significance. The practical side of geometry was developed by the Babylonians, the Egyptians and the Romans; the logical by the Greeks. In the medieval universities the little geometry taught was according to Euclid. England has followed the same standard to the present day. The other European countries, for the most part, have combined both of these aims, and this obtains to-day, with the emphasis on the logical. The same is true in the United States. A third aim in the teaching of geometry arose when the secondary schools began to assume the character of preparatory schools for the universities. The last hundred years have seen this generally brought about, and within the last fifty years it has been fully systematized in the various countries. In treating these several aims it is impossible to completely separate them.

The early Egyptians and Babylonians developed geometry as a means toward a practical end. Both nations were interested in astronomy, and hence a rudimentary geometry found a place with them. The Egyptians employed geometric principles in the building of their pyramids and in surveying. They measured lengths and areas, they built solids of regular design, they showed some skill in geometric drawing in their mural decorations. With all this they experienced the necessary propædeutics for a developed science, yet this development never came. Whether it was the lack of God-given powers or due to the conservatism of the priestly class, that sacredly guarded the learning, one can only conjecture.

The Romans, also, valued geometry for its utility, employing it in architecture and in surveying. But, unlike the Egyptians, they had the learning of other nations to draw upon. This development in architecture and surveying was marked in the first century before and the first century after Christ. Euclid had written his "Elements" approximately three hundred years earlier. Archimedes had already developed geometry as applied to mechanics, and Heron of Alexandria, who studied and wrote on practical geometry and surveying, lived in the early years of this "Roman" period. The work of Heron influenced the Roman surveyors, but Euclid found little favor with the Romans. When the "Elements" was recognized at all, it was that it might be of aid in the training of the orator, which was, for the Romans, a practical aim. In like manner the Hindus and Arabians studied geometry primarily for its practical value, although both of these nations were largely dependent upon the Greeks for their knowledge of geometry.

[1] See the author's "A History of the Teaching of Elementary Geometry," Teachers College Contributions to Education, No. 23, for the original and secondary sources consulted. The present article is not an integral part of the larger work, but material from the latter is utilized in the former.

[2] The term practical is used with reference to the applications of geometry within the field of mathematics or in the related fields of science.